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⑯ Recording and reproducing optical disk device.

⑯ Magneto-optical disk recording and reproducing devices and actuators and distance detectors for use therewith are disclosed. The magneto-optical disk device comprises, in addition to the usual elements, a bimorph type actuator 9, 71 or an electromagnetic actuator 108-115 for driving the magnetic head 8 of the magneto-optical disk device. The bimorph actuator may have a metallic shim 74 whose width varies with respect to the longitudinal distance inversely proportional to the normal function of the first or the second free natural vibration mode. Alternatively, the bimorph type actuator may have a recess 9d formed on a bimorph element 9a to expose a piezoelectric ceramics which outputs a voltage corresponding to the acceleration of the vibration of the actuator; the driver circuit 96 of the actuator reduces the driving voltage when the frequency of the voltage generated at the recess comes into the neighborhood of a higher resonance

frequency of the actuator. The optical distance detector comprises a light-emitting diode 14, 16, 31 and a pair of photodiodes 15, 17, 30 which detect the amount of light incident thereon after being reflected at a surface of an object the distance to which is measured. The geometric parameters of the photodiodes are selected in such a manner that the output of a first photodiode decreases as the measured distance increases while the output of a second photodiode increases as the measured distance increases. Thus, the normalized differential output of the two photodiodes, from which the measured distance is determined, varies substantially linearly with respect to the measured distance. In preferred forms, the photodetectors have stepped concentric configurations so that small distances can be measured accurately and efficiently.

EP 0 336 687 A3

FIG. 25

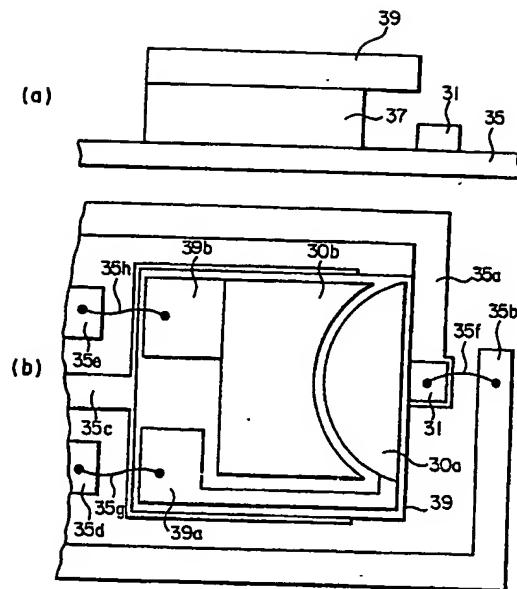


FIG. 9

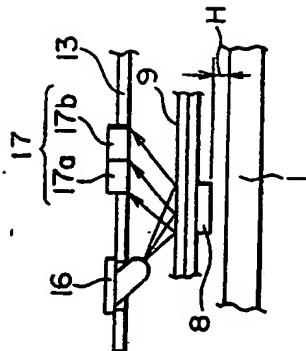


FIG. 8

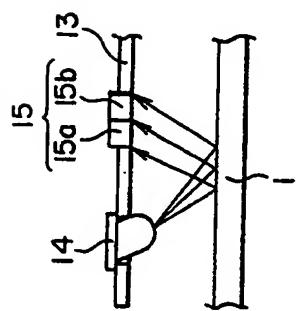


FIG. 54

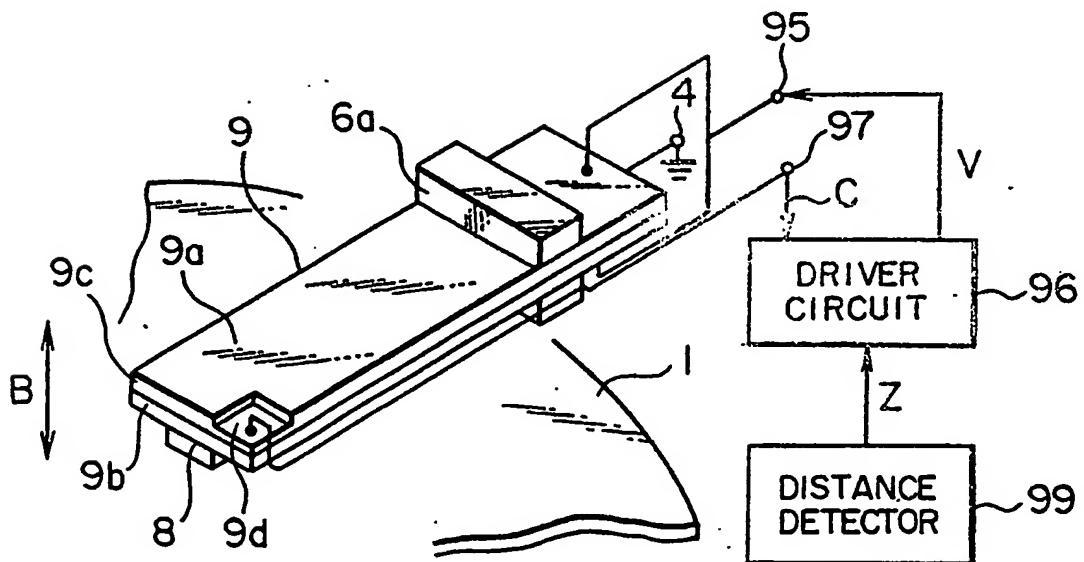


FIG. 58

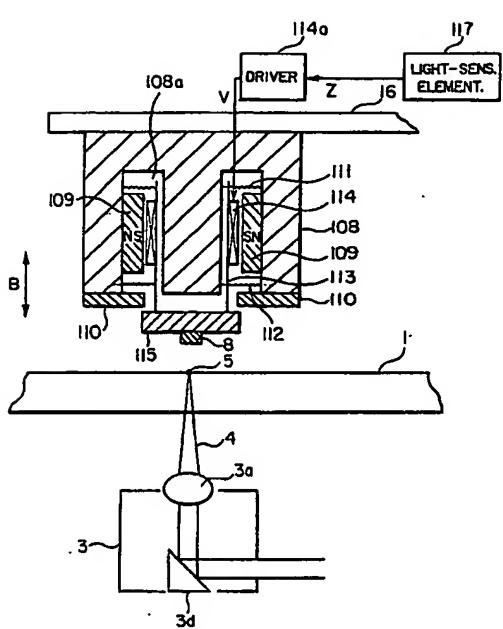
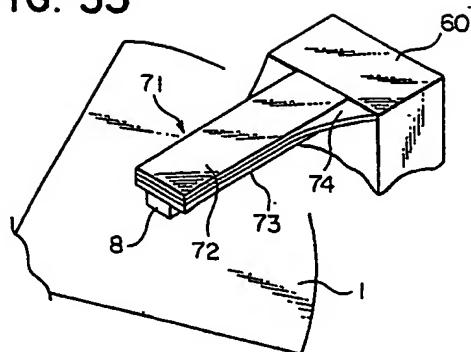


FIG. 53





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EUROPEAN SEARCH REPORT

Application Number

EP 89 30 3282

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
A	EP-A-0 002 547 (N.V. PHILIPS GLOEILAMPENFABRIEKEN) * Page 7, line 17 - page 14, line 24; figure 5 *	1,5-13, 25	G 11 B . 11/10
A	GB-A-2 083 677 (MATSUSHITA ELECTRIC IND. CO., LTD) * Page 2, lines 26-84; page 2, line 103 - page 3, line 115; figures 1-4 *	1,24	
A	EP-A-0 242 837 (SONY CORP.) * Page 8, line 11 - page 13, line 17 *	14-18	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int. Cl.4)
		G 11 B	
Place of search	Date of completion of the search		Examiner
THE HAGUE	21-12-1990		BARBER I.G.
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : also-written disclosure P : intermediate document			



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CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing more than ten claims.

- All claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for all claims.
- Only part of the claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims and for those claims for which claims fees have been paid, namely claims:
- No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirement of unity of invention and relates to several inventions or groups of inventions, namely:

See sheet -B-

- All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.
- Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid.
namely claims:
- None of the further search fees has been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims.

namely claims: 1-18, 24, 25



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EP 89 30 3282 -B-

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirement of unity of invention and relates to several inventions or groups of inventions, namely:

1. Claims 1-18,24,25: Acuator to position permanent magnet head of Magneto-optic record/reproduce apparatus.
2. Claims 19-23,26: Optical Distance detector.